claim the subject matter which Applicants regard as the invention. With respect to claim 10, Applicants have amended the claim, as shown above, to provide proper antecedent basis for "particle beam". With respect to claims 9 and 14, Applicants have amended the claims to change their dependency to new claims 15 and 16, respectively, where it is made clear that the oxygen concentration is related to a concentration on a surface of a silicon layer. More specifically, according to amended claims 9 and 14, the oxygen is distributed between the depth of 0.5 nm and 5 nm from the surface of silicon layer. The depth of this surface region of 0.5-5 nm is extremely small when compared to the unit of the concentration by volume (cm^3) and is recited in newly added claims 15 and 16, for which support can be found at least in, e.g., page 28, lines 5-11 of the specification.

In view of the remarks and amendments set forth above, Applicants respectfully request review and reconsideration of the §112, second paragraph, rejection of claims 9, 10, and 14.

Claims 1, and 6-8 are rejected under 35 U.S.C. §102(b) as anticipated by Tung (U.S. Patent No. 5,728,625 – hereafter Tung). Further, claims 2-14 are rejected under 35 U.S.C. §103(a) as unpatentable over Tung in view of Sugano et al. (U.S. Patent No. 4,469,527 – hereafter Sugano), and claims 1-14 are rejected under 35 U.S.C. §103(a) as unpatentable over Maa et al. (U.S. Patent No. 5,830,775 – hereafter Maa). Still further, claims 9 and 14 are rejected under 35 U.S.C. §103(a) as unpatentable over Maa in view of Sugano and further in view of Yamazaki et al. (U.S. Patent No. 5,956,579 – hereafter Yamazaki). These rejections are respectfully traversed at least for the reasons provided below.

With respect to the §102(b) rejection, as amended, claim 1 of the present invention further recites distributing a nonmetal element (109) towards an inner portion of a substrate and in a region in the vicinity of a surface portion of a semiconductor layer (110).

On the other hand, Tung teaches a step of forming an oxide layer (200) on a semiconductor layer (210). However, Tung fails to teach the step of distributing the nonmetal element (109) towards the inner portion of the substrate and in the region in the vicinity of the surface portion of the semiconductor layer (110).

The step of distributing the nonmetal element (for example, oxygen) in the region in the vicinity of the surface portion of the semiconductor layer literally refers to distributing nonmetal element (e.g., oxygen), and not forming nonmetal element compound (e.g., oxide layer) in the region in the vicinity of the surface portion of the semiconductor layer. According to amended

claim 1, a nonmetal element (e.g., oxygen) is distributed, while according to Tung, a layer composed of nonmetal element oxide (e.g., silicon oxide) is formed. Hence, Applicants' method of claim 1 is distinguishable over that of Tung.

Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim. Lindemann Maschinenfabirk Gmbh v. American Hoist & Derrick, 221 USPQ 481, 485 (Fed. Cir. 1984). Tung clearly fails to disclose the step positively recited and claimed in Applicants independent claim 1. More particularly, Tung fails to disclose distributing a nonmetal element towards an inner portion of a substrate and in a region in the vicinity of a surface portion of said semiconductor layer recited in claim 1. Therefore, the §102(b) of amended claim 1 and its dependent claims 6-8 would be improper.

With respect to the §103(a) rejection of dependent claims 2-14 over Tung in view of Sugano, the arguments and amendments set forth above in relation to the §102(b) rejection of claim 1 are also applicable.

Further, with respect to the rejection of independent claim 11 over Tung and Sugano, similarly to claim 1, the amended claim 11 of the present invention recites distributing a nonmetal element (109) towards an inner portion of a substrate and in a region in the vicinity of a surface portion of a semiconductor layer (110).

Tung teaches the step of forming the oxide layer (200) on the semiconductor layer (210). However, Tung fails to teach the step of distributing the nonmetal element (109) towards the inner portion of the substrate and in the region in the vicinity of the surface portion of the semiconductor layer (110).

Sugano teaches the technique of irradiating the surface of the substrate (32) having the oxide film (31) formed thereon with thermal neutron beams, so that lattice defects are produced, and thereafter irradiating the substrate (32) with laser beam pulses to formed the activated layer (33) in the region of the substrate (32) that is connected to the oxide film (31). However, Sugano fails to teach the step of distributing oxygen in the region in the vicinity of the surface portion of the semiconductor for excellent epitaxial growth. Hence, as Sugano and Tung are deficient as discussed above, the references cannot be combined without proper motivation, and amended claim 11 is distinguishable over the combination of Tung and Sugano.

With respect to the §103(a) rejections of claims 1-14 over Maa and Sugano, Sugano teaches a technique of irradiating the surface of a substrate (32) having an oxide film (31) formed thereon with thermal neutron beams, so that lattice defects are produced, and thereafter irradiating the substrate (32) with laser beam pulses to formed an activated layer (33) in a region of the substrate (32) that is connected to the oxide film (31).

Maa teaches a technique of forming a diffusion layer on an oxide film, which is formed on a semiconductor substrate.

The invention of the amended claim 1, however, includes a step of irradiating a silicon oxide film formed on the semiconductor layer with a particle energy beam, so as to distribute oxygen included in the silicon oxide film towards the inner portion of the substrate and in the region in the vicinity of the surface portion of the semiconductor layer. Applicants respectfully submit that, for excellent epitaxial growth, the invention of claim 1 includes distributing a nonmetal element (i.e. oxygen) in the region in the vicinity of the surface portion of the semiconductor, such as that in the amended claim 1. Therefore, the invention of claim 1 is completely different from the technique of forming the activated layer in the region in the vicinity of the surface portion of the semiconductor, such as that of Sugano. Therefore, the combination of Maa and Sugano would not be proper without suggestion or motivation, and the combination of the deficient Maa and Sugan would not make Applicants' invention of claim 1.

With respect to the §103(a) rejection of claims 1-14 over Maa in view of Sugano, Sugano teaches the technique of irradiating the surface of the substrate (32) having the oxide film (31) formed thereon with thermal neutron beams, so that lattice defects are produced, and thereafter irradiating the substrate (32) with laser beam pulses to formed the activated layer (33) in the region of the substrate (32) that is connected to the oxide film (31).

Maa teaches the technique of forming the diffusion layer on the oxide film, which is formed on the semiconductor substrate.

The invention of the amended claim 11 includes a step of irradiating a silicon oxide film formed on the semiconductor layer with a particle energy beam, so as to distribute oxygen included in the silicon oxide film towards the inner portion of the substrate and in the region in the vicinity of the surface portion of the semiconductor layer. Applicants respectfully submit that, for excellent epitaxial growth, the present invention includes distributing a nonmetal element (i.e. oxygen) in the region in the vicinity of the surface portion of the semiconductor,

such as that in the amended claim 11. Therefore, the invention of claim 11 is completely different from the technique of forming the activated layer in the region in the vicinity of the surface portion of the semiconductor, such as that of Sugano, and the combination of Sugano and Maa would be improper as each reference is deficient and lack proper motivation or suggestion to combine with each other to make Applicants' invention of claim 11.

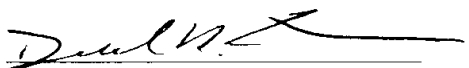
As Sugano and Maa are deficient, as discussed above, their combination with Yamazaki in the §103(a) rejection of claims 9 and 14 would also be improper.

In view of the amendments and arguments set forth above, Applicants respectfully request reconsideration and withdrawal of all of the pending §102(b) and §103(a) rejections.

CONCLUSION

Having responded to the rejection set forth in the outstanding non-Final Office Action, it is submitted that claims 1-14 and new claims 15-16 are now in condition for allowance. An early and favorable Notice of Allowance is respectfully solicited. In the event that the Examiner is of the opinion that a brief telephone or personal interview will facilitate allowance of one or more of the above claims, the Examiner is courteously requested to contact Applicants' undersigned representative.

Respectfully submitted,



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MARKED-UP COPY OF AMENDED CLAIMS:

Claim 1. (Amended) A method for fabricating a semiconductor device comprising the steps of:

distributing a nonmetal element towards an inner portion of a substrate and in a region in the vicinity of a surface portion of a semiconductor layer;

depositing a metal film on said semiconductor layer; and

epitaxially growing a semiconductor-metal compound layer in the surface portion of said semiconductor layer by causing a reaction between an element included in said semiconductor layer and a metal included in said metal film through annealing carried out on said metal film.

Claim 9. (Amended) The method for fabricating a semiconductor device of [Claim 8] Claim 15,

wherein said oxygen has a concentration of 4×10^{14} through 4×10^{15} cm^{-2}.

Claim 11. (Amended) A method for fabricating a semiconductor device comprising the steps of:

forming a gate electrode on a semiconductor layer;

forming impurity layers on both sides of said gate electrode in said semiconductor layer;

distributing a nonmetal element towards an inner portion of a substrate and in a region in the vicinity of a surface portion of said semiconductor layer;

depositing a metal film on said semiconductor layer; and

epitaxially growing a semiconductor-metal compound layer in the surface portion of said semiconductor layer by causing a reaction between an element included in said semiconductor layer and a metal included in said metal film through annealing carried out on said metal film.

Claim 14. (Amended) The method for fabricating a semiconductor device of [Claim 13] Claim 16,

wherein said oxygen has a concentration of 4×10^{14} through 4×10^{15} cm^{-2}.